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4 October 1965
Ref: LJC 283-1674

25X1A

Post Office Box 8043
Southwest Station
Washington, D. C. 20024

25X1A Attention: [redacted]
Contracting Officer

25X1A Subject: [redacted]

Dear Sir:

In accordance with a request by your Technical Representative, we are submitting herewith an Engineering Change Proposal (ECP-135-1). We are enclosing herewith three (3) copies of a technical discussion for these proposed changes. Also included herewith are three (3) copies of a [redacted] Cost Breakdown Worksheet for Phase I in the total amount of $[redacted] and Phase II in the total amount of $[redacted]

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In the event that this ECP is approved, the time impact in order to comply with these changes is as follows:

ILLEGIB

Phase I - Completion Date - 21 February 1966

Phase II - Delivery of First Unit - 22 August 1966

ILLEGIB

Phase II - Delivery of Second Unit - 24 October 1966

In order to meet these dates, it is necessary that we receive your authorization to proceed for this ECP by 21 October 1965.

We trust that this Proposal is complete for your evaluation; however, if any additional information is desired, please feel free to contact me.

Very truly yours,

ORIGINAL SIGNED BY

[redacted]
Contracts

25X1A

"This Document contains information affecting the National Defense of the United States within the meaning of the Espionage Laws, Title 18, U.S.C., Sections 793 and 794, the transmission or revelation of which in any manner to an unauthorized person is prohibited by law."

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Engineering Change Proposal

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UNIVERSAL DATA BLOCK READER

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[redacted]

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1.1 INTRODUCTION

This Engineering Change Proposal has been prepared to describe the changes in scope requested to be included in the Universal Data Block Reader being designed and developed by [redacted] 25X1A under [redacted] 25X1A

1.2 INCREASED DATA RATES

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Due to the added films to be processed by the Universal Data Block Reader a minimum data throughput of 1000 characters per second is required. The present design is capable of recording data at a 300 character per second rate. Therefore, the present design is not capable of meeting the new requirements. The limiting factor in the present design is the output media, i.e. the incremental tape recorder.

To improve the output recording rate it is proposed that the output recorder be changed from an incremental type recorder to a standard digital tape drive capable of recording data at a 25,000 characters per second rate.

The rates at which the data is collected are entirely different from the rate at which a standard tape drive will record the data. Therefore, some storage is required to make the two compatable. An analysis of the collection rate, recording rate and tape utilization (record area versus record gap)

indicates a minimum requirement of 1,000 characters of buffer store. Since the computer has overlap capabilities, there is no need to increase the store beyond this minimum. It is, therefore, proposed that a core buffer store of 1024 characters, 8 bits per character be included in the Universal Data Block Reader.

The theory of operation is as follows:

The read head will sense the data on the film, transfer it to the data organization section which will process it and organize it into IBM compatable characters. The data will then be transferred to the core store. When 1,000 characters have been stored, the control logic will start the tape recorder and the stored data will be written on the tape. The buffer will then be available for storing the next set of data that is to be read. The complete recording operation will take approximately 50 milliseconds and will be completed long before a new set of data is ready for storage in the core buffer.

1.3 PARITY ERROR PRINTOUT

While the present approach checked the data for parity errors, no provision was made to supply a hard copy record of the errors detected. It

is, therefore, proposed that the Universal Data Block Reader be modified to include a printout of the block number in which an error was detected. The technique which will be employed is as follows:

The Universal Data Block Reader will contain an electronic counter which will be reset when a new film is loaded onto the machine. As each data block is read, the counter will be advanced one count. Should a parity error be detected, the contents of the counter will be sampled and fed into a high speed numerical printer. Therefore, a printed record will be available to the operator, stating the data block number in which the error was detected. The data blocks will be assigned numbers consecutively starting from the beginning of the film.

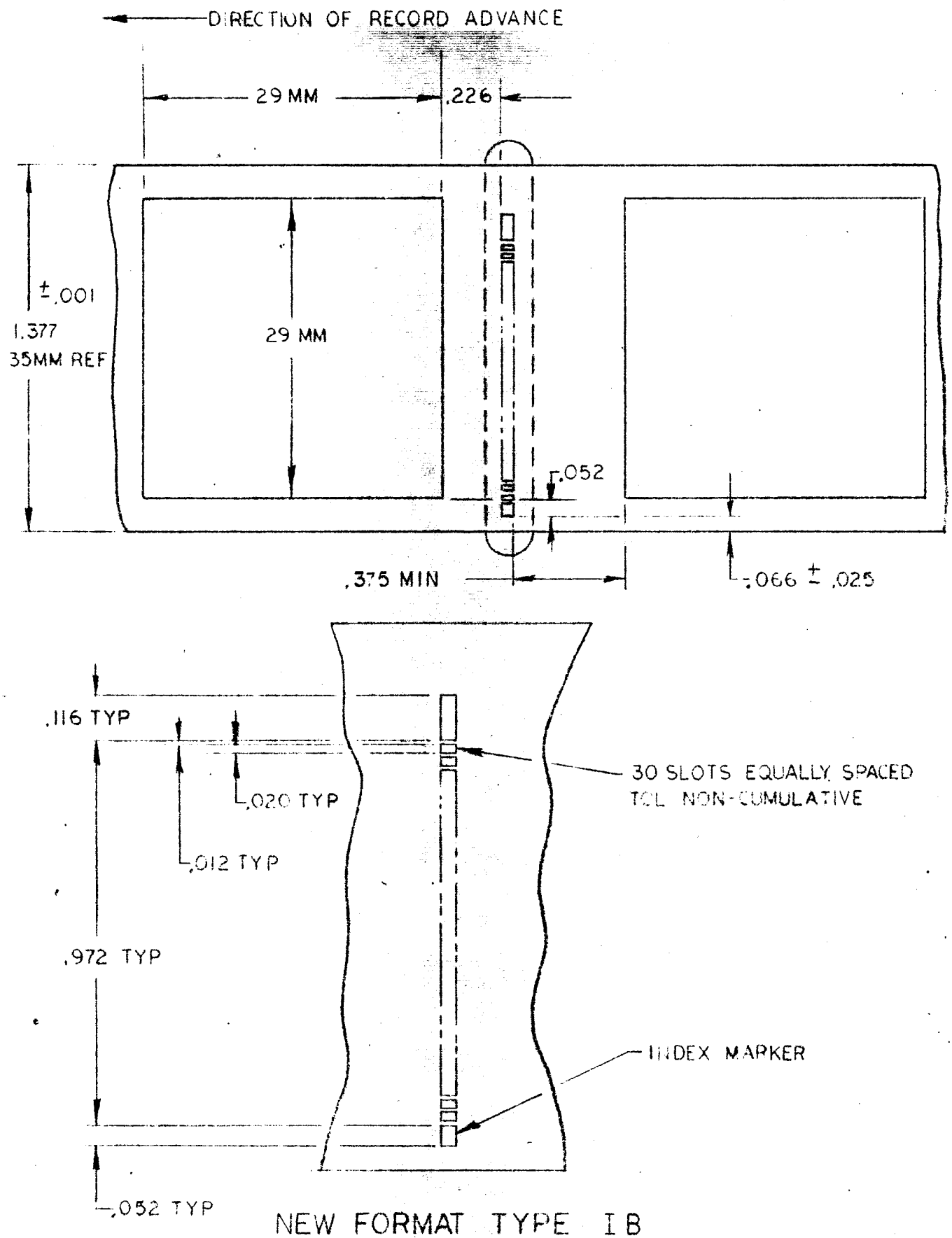
1.4 NEW FORMATS

The introduction of the two new formats to be read presents a number of problems necessitating an extensive amount of design change in the Universal Data Block Reader. Some of the changes will be common to both the 35mm and the 5 inch film and some will be unique to the 5 inch film alone.

1.4.1 35mm Film

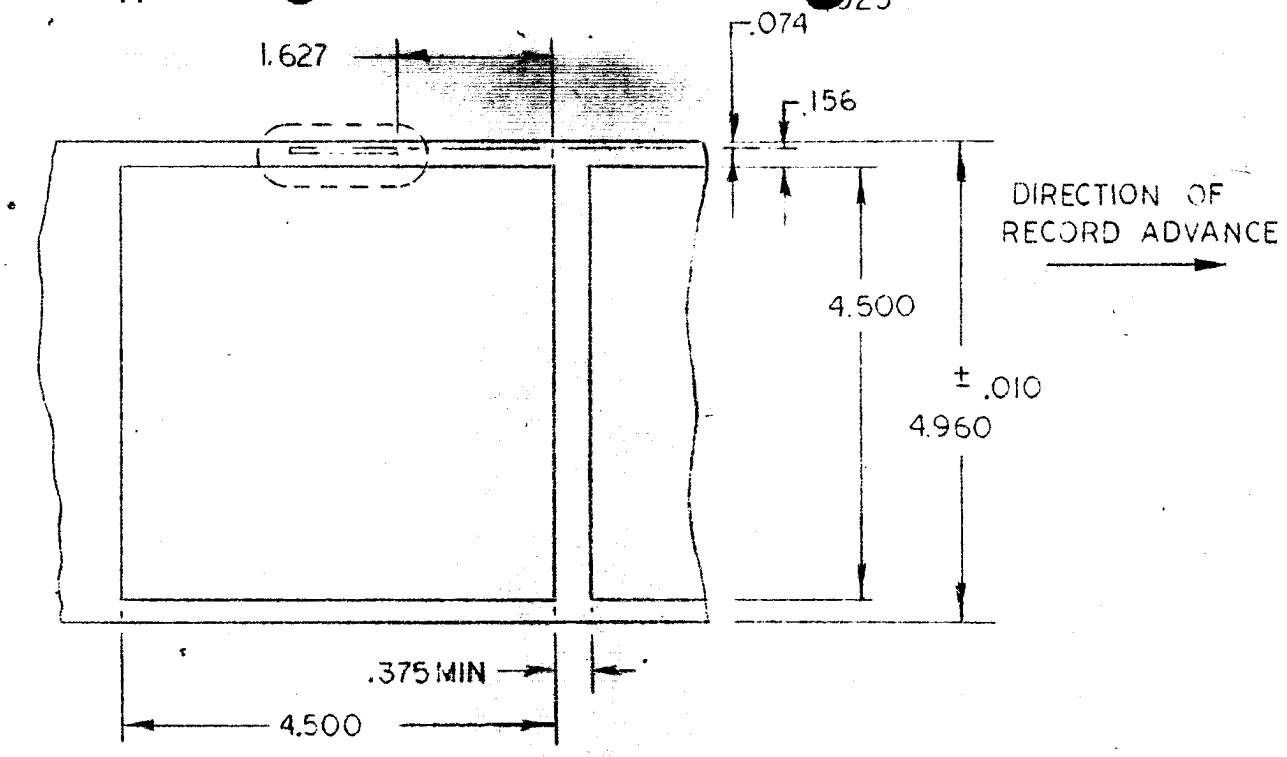
The main problem encountered with the 35mm film is that the geometry of the data block is completely different, in all respects, from that of all of the other formats. The overall size of the data block is larger, the space between bits is smaller and the shape of a bit is rectangular rather than round. Please refer to Figures 1 and 2.

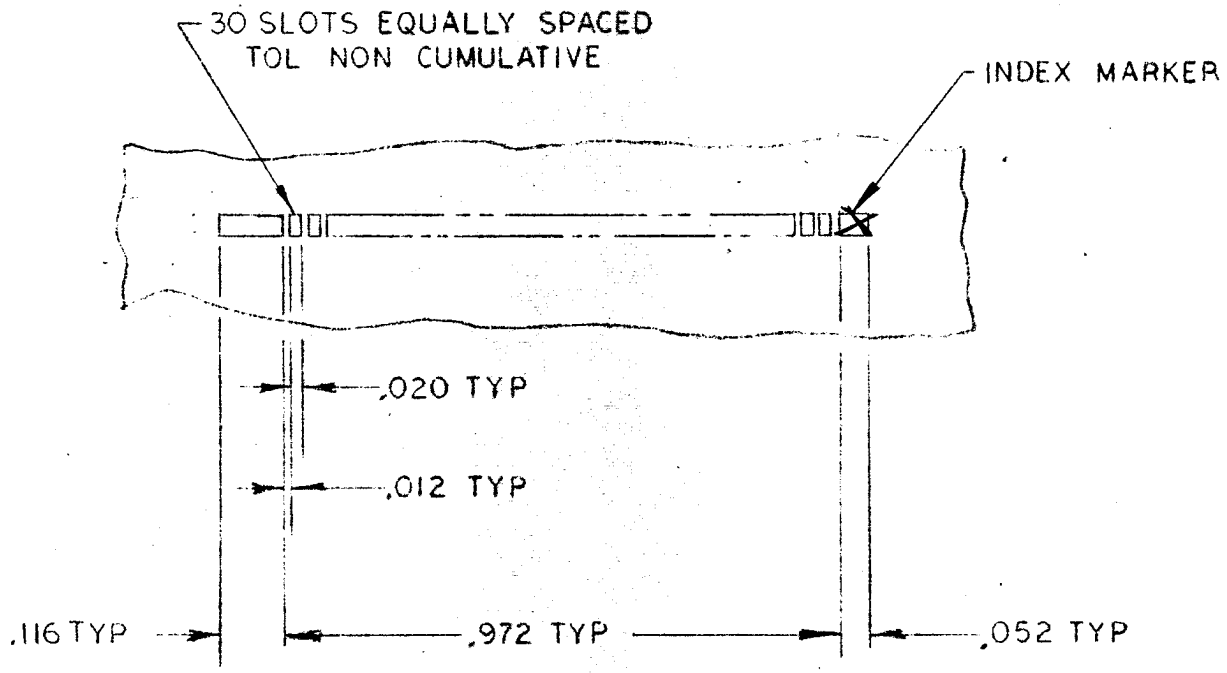
It is proposed that the optical system of the Universal Data Block Reader be modified to include an additional magnification ratio to produce the .032" pitch of the data block to the .018" pitch of the read head. Please refer to Figure 3. This modification requires the addition of a dual motion capability in the optical system. The lens and the diode array must be repositioned to very close tolerances. To reduce the complexity of the change over and the technical level of the operator required, two separate mounts will be employed in addition to the overall optical housing. Individual shimmed stops for each of the four locations will be provided. These stops will be factory adjusted so that no re-focusing will be necessary by the operator. In addition, to insure that the lens and head are seated properly at their pre-focused positions, a spring loaded detent mechanism will be utilized. This rigid detent will be used to lock all movable elements into position.



NEW FORMAT TYPE I B

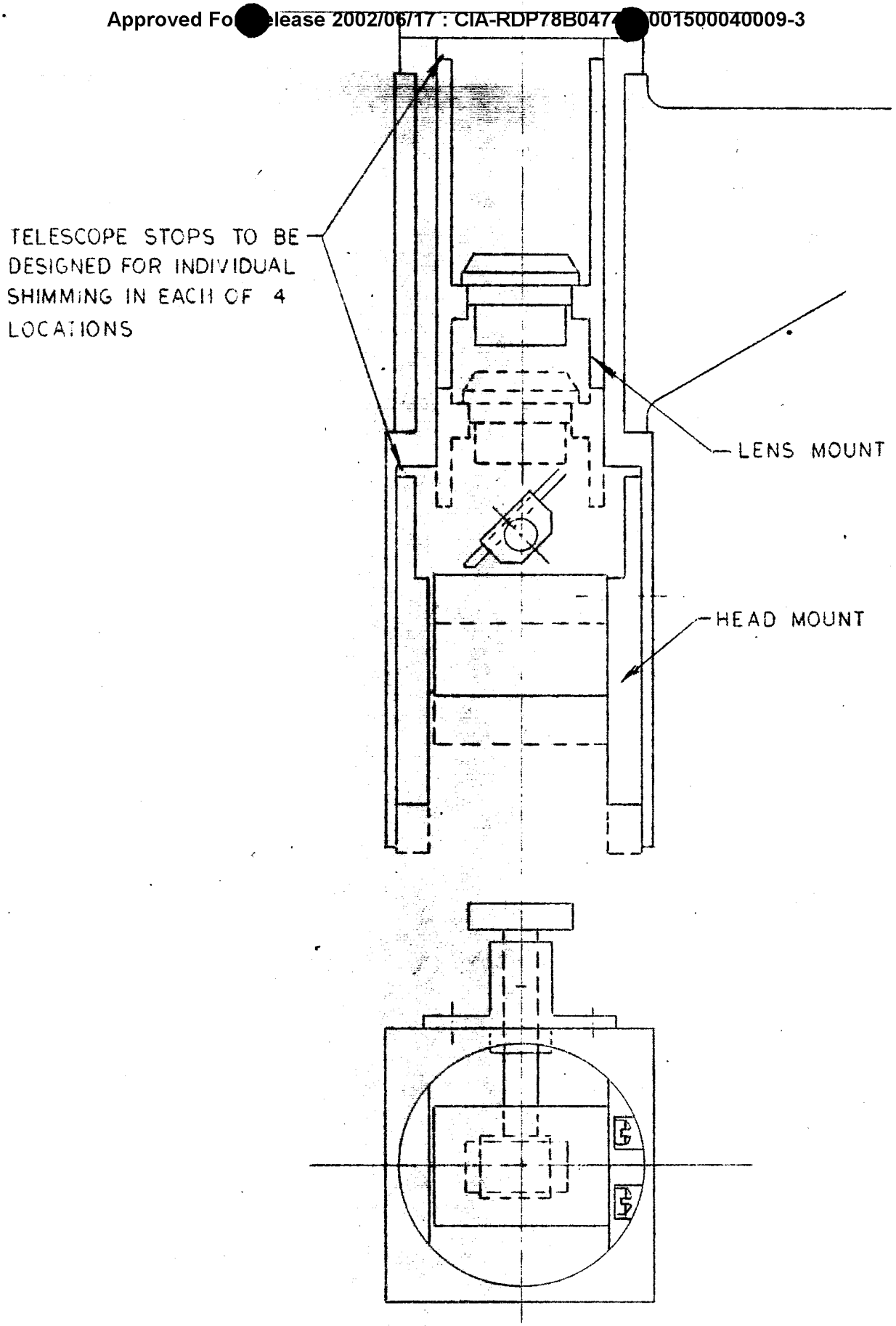
FIGURE 1





NEW FORMAT TYPE IA

FIGURE 2



DUAL POSITION HEAD MOUNT

FIGURE 3

By incorporating a reduction in the data block's projected image it is now feasable to utilize the same read head structure in extracting the information for all data formats. While the same read head is employed, the logic necessary for wander correction will be different. The switch over to the new logic will be performed by the operator when setting up the machine for the new film. This switch over will occurr automatically when the operator depresses the Film Selector Switch on the front control panel. The philosophy which will be employed for film wander correction will be the same as in the present design. However, the number of gates, the interconnection between the gates, and the bias level of the Data Block Locator will be different.

1.4.2 5 Inch Film

The 5 inch film has the same problem as the 35mm film with respect to its geometry and the solution for the 35mm will be employed for the 5 inch film as well.

In addition, the 5 inch film presents one more problem. All of the other formats contain an index bit in line with each column of data which is used as a strobe for locating where the column lies. In this format, the index bits do not exists. Please refer to Figure 2.

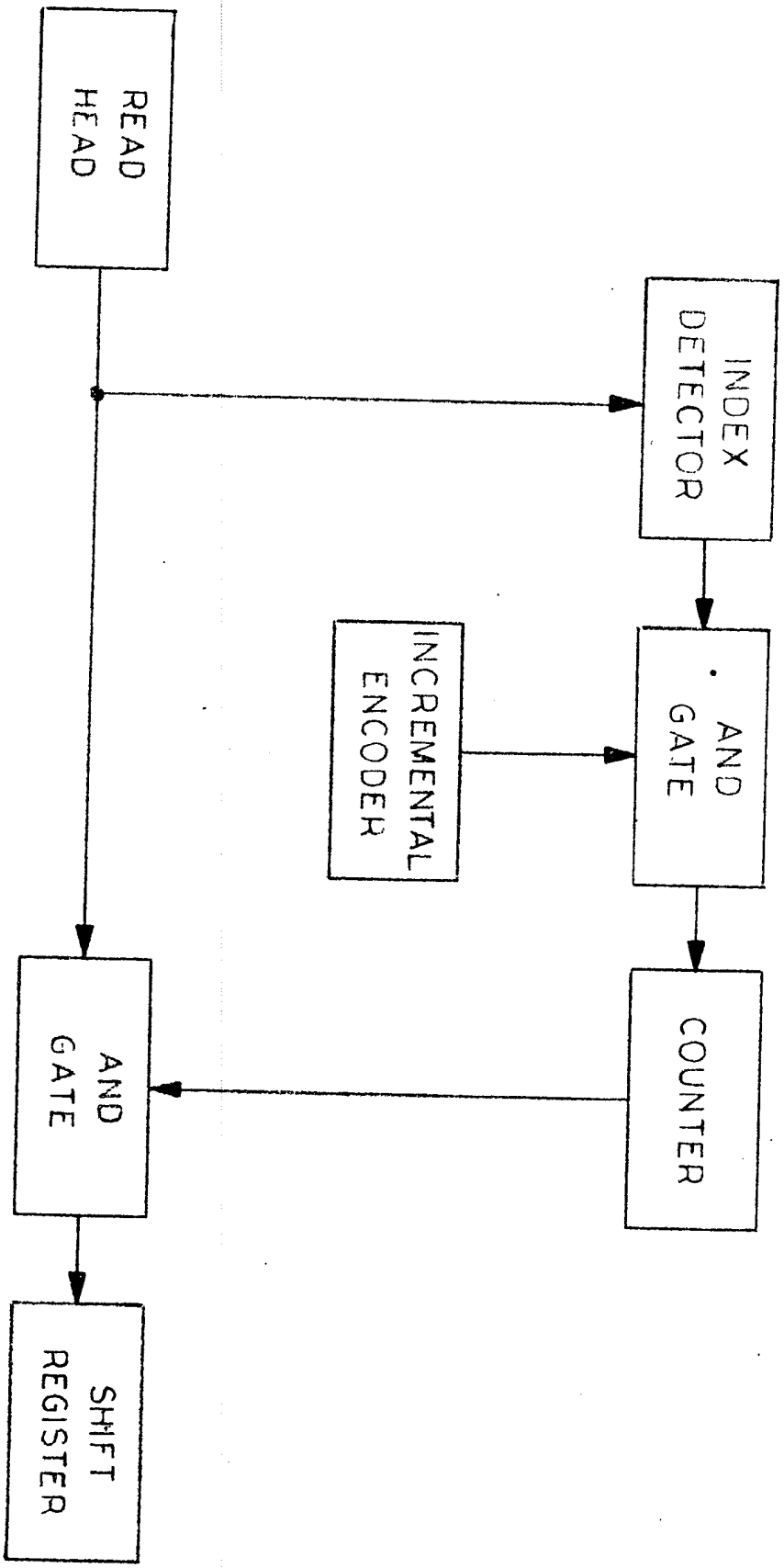
There are two approaches which may be employed to solve this problem. One is to turn the head 90° and employ the head geometry to define where the bits should be. The other is to accurately time the location of each bit from a known reference (in this case the single index bit which leads the data).

Originally it was thought that the first approach would be taken. However, after discussion with the head manufacturers, [redacted] Semiconductor, it was decided that an alternate method should be employed since it would take a minimum of six months to develop a new head. The alternate approach relies upon an incremental encoder to develop a pulse train whose frequency is a function of the film movement. This digital incremental shaft encoder will be mounted directly to the capstan shaft which is driving the film under the head. Should the capstan change speed due to load conditions, the encoder will follow and thus the timing pulse train will shift in frequency. Therefore, the pulse train output of the encoder will be directly proportional to the film movement and can be employed to measure distance along the film. 25X1A

The theory of operation is as follows, please refer to Figure 4:

The logic will sense the output of the read head, looking for the index bit. When the index bit is located, a gate will open allowing the pulse train output of the incremental shaft encoder to enter the counter. The

What counter?



BLOCK DIAGRAM
BIT LOCATION LOGIC
5 IN. FILM

FIGURE 4

counter will accumulate the pulses until a preselected count has been reached. At that time a gate will open allowing the data from the read head to enter the shift register for storage. Since the pulse train is directly proportional to distance, the counter will in effect be measuring distance. The read out time can be selected to strobe the center of a typical bit; this allowing for a maximum amount of dimensional deviation.